REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. This amendment adds, changes and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 24-106 are now pending in this application. New independent claims 98, 101 and 104 and dependent claims 71-97, 99-100, 102-103 and 105-106 have been added.

I. Support for the Amendments

The support for the amendments to the claims and for the new claims is provided in the examples specification as follows. First, the value of 1.34 BTU/ft^2 was changed to 1.22 BTU/ft^2 because the 1.34 value was calculated based on a Q_{equil} value of 19.9B/hr from example 2 rounded to the nearest tenth. However, the actual Q_{equil} value of 19.98 B/hr from example 2 rounded to the nearest hundredth provides the value of 1.22 BTU/ft^2 that is now recited in claims 61 and 69 and other dependent claims.

The values of thermal loading in BTU/ft^3 are calculated from examples 1 and 2 in a similar way as the values of thermal loading in BTU/ft^2. In example 2 (ski or sport boot) on page 21 of the specification, the thickness x1 + x2 + x3 + x4 is 1 and 3/16" (plus phase change material thickness, estimated to be zero when small) and the phase change material may dispersed through its thickness as in Figure 1. Using this thickness, the BTU/ft^2 values calculated in the previous response may be easily converted to BTU/ft^3 values as follows:

a. 1.22 BTU/ft^2 x 1/(1 3/16" + 0") x 12"/ft = 12.33 BTU/ft^3

b. 10.3 BTU/ft^2 x 1/(1 3/16" + 0") x 12"/ft = 104.08 BTU/ft^3

c. 94 BTU/ft^2 x [1/(1 3/16 + ¼)] " x 12"/ft = 784.70 BTU/ft^3

d. $29.7\ BTU/ft^2 \times 1/(1\ 3/16" + 0") \times 12"ft = 300.13\ BTU/ft^3$

For example 1 (wet suit) of the specification, the thickness ranges from 0.5" (x1 + x2 + x3) when the phase change material is dispersed throughout the thickness as shown in Figure 1, to a thin, solid or nearly solid layer of phase change material shown in Figures 2, 17 and 19. This results in the following values of $46.67\ BTU/ft^2 \times (1/0.5") \times 12"/ft = 1120.08\ BTU/ft^3$ for the dispersed phase change material to $46.67\ BTU/ft^2 \times (1/0.125") \times 12"/ft = 4480.3\ BTU/ft^3$ for the solid or nearly solid layer.

Likewise, when the dimensions of the entire garment are taken into account, then the thermal loading values for the entire garment may be calculated from the values above. Thus, in example 2, the values of thermal loading values for the entire garment corresponding to the previously calculated thermal loading per area or volume values are as follows: 0.82 BTU, 6.87 BTU, 63 BTU and 19.9 BTU. In example 1, the value of thermal loading values for the entire garment is 840 BTU for four hours, or 210 BTU for one hour. In claim 84, the values were calculated by multiplying the value in claim 50 by 4 and 9 hours recited in claim 56.

Support for claim 97 may be found on page 8, lines 35-60 of the specification. Support for claims 98, 101 and 104 may be found in the examples. For example in the wet suit example, the lower end point of the BTU per square foot range varies from $11.67\ BTU/ft^2$ for a four hour design to $46.67\ BTU/ft^2$ for a one hour design. Thus, for a 2.2 hour design within the 1-4 hour range provided in the specification, the BTU/ft^2 value is $[(46.67/4)x2.2] = 25.63\ BTU/ft^2$ recited in claim 98. The temperature of 94.1 F is provided in Table I of the specification (cotton seed oil material's temperature).

In the ski boot example, the the lower end point of the BTU per square foot range varies from $1.22\ BTU/ft^2$ for a one hour design to $94\ BTU/ft^2$ for a nine hour design. Thus, for a 7 hour design within the 1-9 hour range provided in the specification, the BTU/ft^2 value is $73.1\ BTU/ft^2$ recited in claim 101. The temperature of 83.3 F is provided in Table I of the specification (cotton seed stearin material's temperature).

Returning to the wet suit example, the upper end point of the BTU per cubic foot range varies from $1120\ BTU/ft^3$ for a one hour design to $4480\ BTU/ft^3$ for a four hour design. Thus,

for a 3 hour design within the 1-4 hour range provided in the specification, the BTU/ft^3 value is 3360 BTU/ft^3 recited in claim 104.

Applicant appreciates the courtesy extended by examiner Zacharia in conducting a telephone interview with the applicant and the undersigned representative on August 26, 2003. During the interview the following issues were discussed.

II. Claims 23-70

Claims 23-70 were rejected under § 102(b) and § 103(a) over Bryant or Sayler alone or in combination with secondary references. These rejections are respectively traversed.

As discussed during the interview, it was agreed that the concept disclosed in the present application of using a cooling phase change material (i.e., with a low phase change temperature) for a garment wearable in cold weather is not taught or suggested by Bryant and Sayler. As was agreed, the applied prior art references generally teach to use a heating phase change material for a cold environment or a cooling phase change material for a hot environment. In contrast, the concept disclosed in the present application is of a buffering thermal storage material or dynamic thermal capacitor which both provides thermal comfort by absorbing metabolic heat and protects the wearer from a cold environment using metabolic regeneration by providing a sufficient thermal mass which at least partially decouples the wearer from the cold environment and is not disclosed in these applied prior art references.

With respect to independent claims 61 and 69 which recite thermal loading ranges of the phase change material, it was agreed during the interview that the applied prior art references do not teach or suggest that thermal loading of the phase change material is a result effective variable. Furthermore, as correctly noted by the examiner, even if the thermal loading of the prior art phase change material was optimized, the resulting value of thermal loading would not necessarily be in the claimed range because the applied prior art references teach to use the phase change material for a different purpose or in a different environment. Thus, there is no motivation to arrive at the claimed thermal loading ranges of claims 61 and 69. Applicant respectfully requests a withdrawal of the rejections of claims 61 and 69 and claims which depend there from.

With respect to claims 24, 50 and 59, the examiner requested that the functional recitation of thermal mass be replaced with numerical thermal mass ranges in a manner similar to claims 61 and 69. In response, claims 24 and 59 have been amended to recite a thermal mass which corresponds to a range of thermal loading of the phase change material per volume of the garment. Claim 50 has been amended to recite a thermal mass which corresponds to a range of thermal loading of the phase change material for the entire garment. Applicant respectfully submits that claims 24, 50 and 59 are in condition for allowance at least for the same reasons as claims 61 and 69, since the applied prior art references do not teach or suggest the claimed thermal loading ranges.

III. Claims 98-106

Claims 98, 101 and 104 recite higher transition temperatures than the other independent claims. However, Applicant submits that the thermal loading recited in these claims is outside the estimated thermal loading and/or transition temperatures of the Hearst and Feldman patents cited in the previous office action.

A. Hearst

The following is an estimate of lower limit of thermal loading in the Hearst patent. The phase change material of Hearst is lithium nitrate trihydrate. Thus, h_f = 71 cal/g x 4.187 J/cal x 1000g/kg x 4.2995×10^{-4} (B/lbm)/(J/kg) = 127.8 (B/lbm)/(J/kg). No surface area of the material was given, but one can make a conservative estimate of 18 ft^2. No thickness of the material was given, but a nearly solid layer implied. The specific gravity from data safety sheet is 2.38. 4 pounds of material was used.

Thus, the estimated thermal loading of Hearst is 127.8 B/1bm x 4 = 511 BTU. 511 BTU / 18 ft^2 = 28.4 BTU/ft^2. Nearly solid layer assumes ρ of lithium nitrate trihydrate of 2.38 x 62.43 1bm/ft^3 x 127.8 B/lbm = 18,989 BTU/ft^3. Even for 50% loading this value is 9494.5 B/ft^3.

B. Feldman

The following is an estimate of lower limit of thermal loading in the Feldman patent. The phase change material of Feldman is zinc nitrate hexahydrate. h_f = 56 B/1bm. Sponge = ¼" thick, with 50% void (pg. 9, line 59 of Feldman). No surface area of the material was given, but one can make a conservative estimate of 4" x 6" x 2 = 48 in^2 = 0.333 ft^2. No density is given, but s.g. = 2.065 from data safety sheet. Thus, it is assumed that the density is 2.065 x 62.43 1bm/ft^3 = 128.9 1bm/ft^3.

Thus, the estimated thermal loading of Feldman is 56 B/1bm x 128.9 1bm/ft^3 x 0.333 ft^2 x 0.25/12 ft x 0.5 (voids) = 25 BTU. 25 BTU/ 0.333 ft^2 = 75 BTU/ft^2. If the layer is 50% void, then 75 BTU/ft^2 x 1/(0.25/12) ft = 3600 BTU/ft^3.

C. Summary

As provided in the table below, at least one of the temperature and thermal loading ranges of claims 98, 101 and 104 are outside the respective estimated ranges of Hearst and Feldman

	Transition Temperature (F)	**BTU/ft^2**	**BTU/ft^3**
Hearst	86 F and above	28.4 and above	At least 9494.5, such as 18,989 and above
Feldman	82 F and above	75 and above	3600 and above
<u>Present Claims</u>			
Claim 98	41.9 to 94.1	1.22-25.63 (lower than Hearst and Feldman)	----
Claim 101	41.9 to 83.3 (lower than Hearst)	1.22-73.1 (lower than Feldman)	----
Claim 104	41.9 to 94.1	-----	12.33 – 3360 (lower than Hearst and Feldman)

IV. Conclusion

Applicant respectfully requests the examiner to contact the undersigned representative by telephone prior to issuing the next office action if the next office action is not a notice of allowance to discuss how to place the application in condition for allowance.

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

Respectfully submitted,

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The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.